Land Use Change in Canada

Urbanization in the Prairie Provinces

Lands Directorate

Fact Sheet 87-1

Urbanization in the Prairie Provinces

Major urban centres in the prairie provinces of Alberta, Saskatchewan, and Manitoba are characteristically situated in areas having high capability for agriculture. Each of the five major prairie urban-centred regions (UCRs) — Winnipeg, Regina, Saskatoon, Calgary and Edmonton, *(see Figure 1)* nevertheless do have some land available for expansion which is not identified as high capability or prime agricultural land (Canada Land Inventory agricultural capability classes 1, 2, 3).

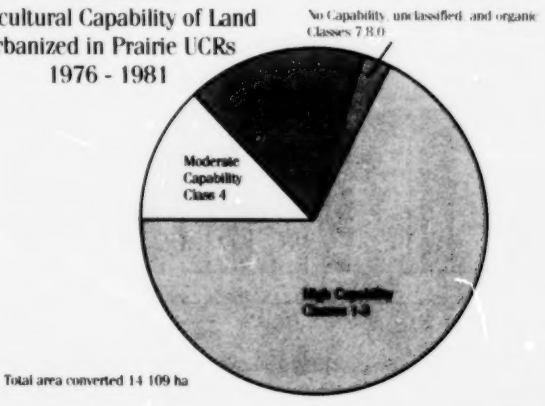
This Fact Sheet examines the pattern of land-use change during the period 1976-1981 for the five major prairie UCRs. The data were produced under the Canada Land Use Monitoring Program (CLUMP) of the Lands Directorate, and indicate that 68% of the 14 109 hectares (ha) of rural land converted to urban uses was prime agricultural land. By comparison, the national average of rural to urban conversion for the same period was 50%.

FIGURE 1
Major Prairie UCRs

Highlights

- 14 109 ha of rural land were converted to urban uses between 1976-1981.
- High capability agricultural land accounted for 68% or 9 587 ha of the total rural land converted to urban uses.
- The amount of high capability agricultural land available, as a percentage of the total area, was 75%. Winnipeg, at 96%, had the greatest percentage of prime agricultural land within its UCR boundaries.
- Generally, the conversion of high capability agricultural land to urban uses occurred at a lower rate than might have been expected if expansion had been randomly based.
- The overall growth in area of urban uses was 8%; Saskatoon's percentage growth in urban uses was the highest at 21%.
- All UCRs had land available for urbanization which was not hign capability agricultural land; Winnipeg and Regina had the least amounts of such land.
- In 1981, three main uses represented 97% of all land in the five prairie UCRs: agricultural uses - 74%; urban uses 13%; and unused/idle uses 10%.

FIGURE 2
Agricultural Capability of Land Urbanized in Prairie UCRs 1976 - 1981



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Regional Overview

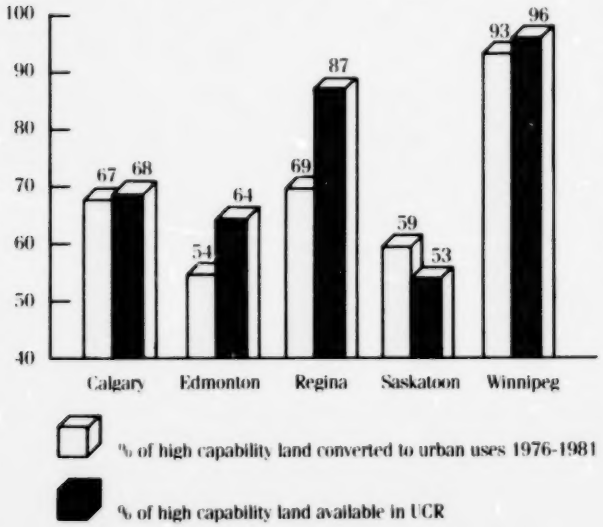
Land-Use Change 1976-1981

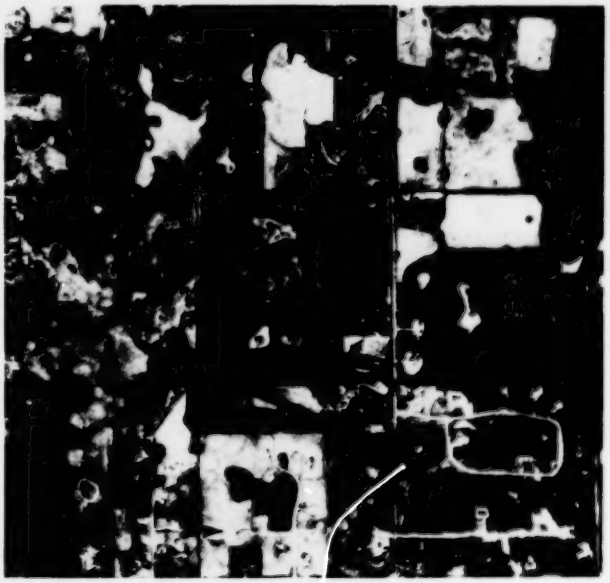
During the period 1976-1981, 14 109 ha of land were converted from rural to urban uses in the five major prairie UCRs. This represents a total growth of 8% in the area devoted to urban uses. With the exception of Saskatoon, where the area occupied by urban uses grew by 21%, increases ranged from 7% for Calgary to 10% for Regina. By comparison, the average growth in urban uses nationally was just less than 11%.

Growth in the area of urban uses is, in part, a reflection of increased populations. Between 1976 and 1981, the population of the Census Metropolitan Areas of the five prairie UCRs increased by about 15%, from 1.9 million to 2.2 million. Calgary experienced the most rapid growth while Winnipeg's population had the least change.

The conversion of high capability agricultural land to urban uses is a significant national issue. In the prairie provinces, a substantial amount of high capability farmland near major urban centres has been lost. During the study period, the conversion of high capability agricultural land occurred at a rate well above the national average. This was particularly the case for the Winnipeg UCR. It should be noted, however, that the percentage of high capability agricultural land adjacent to prairie cities is also much higher than the national average. Approximately 753 000 ha (75%) of land in non-urban uses is rated as CLI capability classes 1-3 for agriculture. The Winnipeg UCR has the highest percentage of such land, with 96% of its area being high capability agricultural land, while the Saskatoon UCR, at 53%, has the lowest percentage.

FIGURE 3
Availability and Selection of High Capability Agricultural Land for Urban Uses 1976-1981





Edmonton UCR - 1977

Courtesy of Energy, Mines and Resources Canada

Edmonton UCR - 1981

Courtesy of Energy, Mines and Resources Canada

Approximately 9 600 hectares or 68% of the total area of rural land which was converted to urban uses betwen 1976 and 1981 had high capability for agriculture. Although this is a very high figure it is still lower than the total available proportion (75%) of high capability land. The availability of prime agricultural land compared to its selection for urban uses in each prairie UCR is shown in Figure 3. Saskatoon is the only centre which utilized high capability agricultural land for expansion in greater proportion than its availability.

A measure of use-concentration has been devised to compare the availability of high capability agricultural land in relation to its use for non-agricultural activities. The measure is derived by dividing the percentage of the land use occurring on Classes 1-3 agricultural capability land by the percentage of the total high capability land in the UCR. A value of greater than one indicates a disproportionately high concentration of a particular activity on high capability land. Less than one indicates that a particular activity is using less high capability agricultural land than expected in relation to the overall occurrence of such land in the UCR. A value of one suggests a random occurrence of an activity with no evidence of influence either towards or away from high capability agricultural land. Measures of total use concentration and the area urbanized between 1976-81 are summarized in Table 1.

The use-concentration values of most non-agricultural activities are less than one. This suggests that non-agricultural activities have generally been diverted away from high capability agricultural land. The fact that high capability land was converted to urban uses at a lower rate than might have been expected under random expansion, is indicated by the recent trend to locate estate lots and satellite communities in wooded areas and on more varied topography. Both landscape features are often indicative of lower capability for agriculture.

Exceptions to this trend are seen in the Regina and Winnipeg UCRs where urban-related uses and land in transition appear disproportionately concentrated on land with high agricultural capability. In addition land urbanized between 1976-1981 in the Saskatoon UCR shows a positive correlation (value greater than one) with high capability agricultural land. This suggests that high capability agricultural land was given preference for urban expansion over lower capability land.

Land Use in 1981

The total area (1 155 374 ha) of the five major prairie UCRs has been grouped into three main land use categories for 1981: agricultural (74%); urban-related activities (13%); and unused/idle land (9%). Sub-categories are designated for all of these *(see Table 2)*.

The proportion of land devoted to agricultural uses in the five prairie UCRs ranged from 84% for the Regina UCR to 68% for the Winnipeg UCR. Overall, 68% of agricultural land was in annually tilled crops and 21% in unimproved grazing land/rough pasture. Considerable variation existed among the UCRs, however. For instance, 90% (162 155 ha) of the total unimproved grazing land was located in the Calgary and Edmonton UCRs. In contrast, only 2 900 ha of unimproved grazing land or less than 2% of the UCR area was found in the Winnipeg UCR.

Urban-related activities formed the second largest land-use category in all but the Edmonton UCR where the unused/idle land area was slightly larger. Generally, urban-related activities form compact areas in the prairie UCRs. Exceptions to this pattern are found (1) in the Edmonton UCR where numerous dispersed areas of urban-related activities are associated with estate-lot developments and smaller urban

TABLE 1
Use-concentration Coefficient of Prime Agricultural Land

	Calgary	Edmonton	Regina	Saskatoon	Winnipeg	All Centres
Improved Agriculture	1.3	1.3	1.1	1.2	1.0	1.2
Unimproved Agriculture	0.8	0.7	0.4	0.4	0.9	0.5
Urban-Related	0.6	0.7	1.1	0.5	1.0	0.8
Extraction	0.3	0.9	0.2	0.2	0.3	0.6
Recreation	0.2	0.7	0.6	0.7	0.7	0.6
Land in Transition	0.7	0.8	1.1	0.8	1.0	0.8
Unused or Idle	0.6	0.6	0.8	0.8	1.0	0.6
Land Urbanized 1976-1981	1.0	0.8	0.8	1.1	1.0	0.9

>1 - High Concentration, 1 - Neutral, <1 - Low Concentration

centres and (2) in the Winnipeg UCR where a strip of urban-related activities extends north along the Red River to Selkirk.

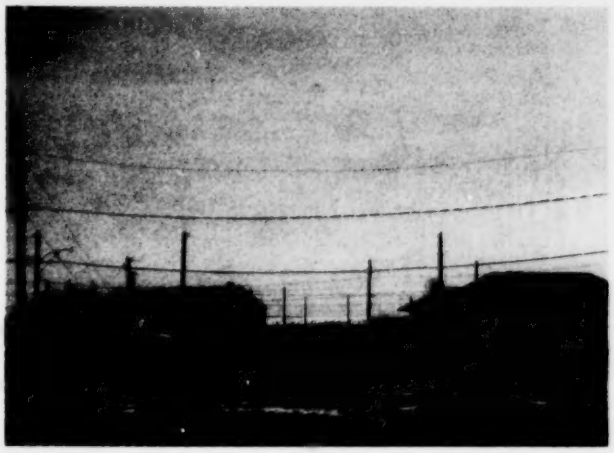
Unused and idle land forms the third largest category in all UCRs except Edmonton where it is second to agricultural use. Together, Edmonton and Calgary contain 80% of all unused and idle land in the five UCRs. In the Edmonton UCR, this category of land use is concentrated in the extreme western portion and in the southwest, north of the North Saskatchewan River. In the Calgary UCR, unused and idle land is located in two distinct areas. Much of the wooded unused/idle land is located either southwest of the Sarcee Indian Reserve or on the Camp Sarcee Military Reserve southwest of Calgary. In contrast, large blocks of grassed unused/idle land are located on the periphery of the built-up area. This suggests that land located near the edge of the built-up portion of Calgary is being withdrawn from other activities, mainly agriculture, for possible future urban development. Grassed unused/idle land is similarly located in the urban periphery of the Winnipeg UCR.

TABLE 2
Land Use in 1981

	Calgary		Edmonton		Regina		Saskatoon		Winnipeg		Total	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
TOTAL	**281 748**	**100**	**489 959**	**100**	**100 916**	**100**	**82 760**	**100**	**199 991**	**100**	**1 155 374**	**100**
Agriculture	**211 535**	**75**	**353 974**	**73**	**85 166**	**84**	**65 646**	**79**	**136 048**	**68**	**854 389**	**74**
Annual tillage crops	108 292		205 936		72 750		47 368		121 898			
Improved grazing and forage	25 805		49 226		3 443		8 153		6 476			
Unimporved grazing	72 607		89 548		7 570		8 095		2 906			
Other productive activities	457		2 245		327		679		138			
Site activities	4 394		9 019		1 076		1 351		4 630			
Forestry and Wildlife	**40**	**<1**	**0**	**0**	**368**	**<1**	**497**	**<1**	**0**	**0**	**1 105**	**<1**
Extraction	**1 167**	**<1**	**2 696**	**<1**	**447**	**<1**	**151**	**<1**	**886**	**<1**	**5 347**	**<1**
Land Dependent Recreation	**3 024**	**1**	**1 549**	**<1**	**463**	**<1**	**660**	**1**	**5 101**	**3**	**10 797**	**<1**
Conservation and Drainage	**205**	**<1**	**0**	**0**	**63**	**<1**	**13**	**<1**	**4 159**	**2**	**4 440**	**<1**
Urban Related Activities	**34 119**	**12**	**57 593**	**12**	**12 055**	**12**	**9 425**	**11**	**37 568**	**19**	**150 760**	**13**
Dwelling	11 153		26 629		623		3 218		11 796			
Manufacturing and commercial	3 048		8 736		695		1 324		4 459			
Water treatment and disposal	345		965		196		67		496			
Transport and communication	3 868		4 186		2 868		1 000		8 348			
Institutional	1 191		1 384		284		120		1 653			
Recreational and cultural site activities	590		1 635		385		212		847			
Urban undifferentiated	13 924		14 058		7 004		3 484		9 969			
Land in Transition	**4 373**	**2**	**9 343**	**2**	**241**	**<1**	**1 025**	**1**	**2 072**	**1**	**17 054**	**1**
Unused and Idle Land	**26 557**	**9**	**62 232**	**13**	**1 902**	**2**	**5 342**	**6**	**13 622**	**7**	**109 655**	**9**
Wooded Cover	16 351		45 795		253		2 121		6 570			
Grass Cover	9 922		12 331		1 613		3 093		7 010			
Other Cover	284		4 106		36		128		42			
Misclassified	**708**	**<1**	**572**	**<1**	**11**	**<1**	**1**	**<1**	535	**<1**	**1 827**	**<1**

Figures have been rounded to the nearest whole number.

Edmonton UCR
Courtesy of Edmonton Metropolitan Regional Planning Commission



Regina UCR
Courtesy of Sask. Urban Affairs

Land in transition is, by definition, land with evidence of active disturbance indicating the likelihood of another future land-use activity. This category of land, usually associated with active urban expansion, is located on the periphery of the built-up area in all UCRs. In the Edmonton UCR, large blocks of this category were also found dispersed throughout the UCR in association with the dispersed pattern of urban-related activities. In 1981, 80% of all land in transition was located in the Calgary and Edmonton UCRs. If all land in transition is actually urbanized, there will be an 11% increase in the area of urban-related activities in the five prairie UCRs.

Land-dependent recreation occupies less than 1% of the total prairie UCR area. Birds Hill Provincial Park, northeast of the City of Winnipeg, accounts for most of this type of use. Almost one-half of the total area in this category is in the Winnipeg UCR.

Conservation and drainage activities comprise less than one-half a percent of the total UCR area. Eighty-five percent of such land is located in the Winnipeg UCR where the Red River Floodway was built to divert floodwater around the City to the east and back into the Red River to the north.

The distribution of land uses for each of the UCRs is shown in Figures 4 to 8.

Resource Potential

In 1981, each of the five prairie UCRs had land available for urbanization which was not of high capability for agriculture. At the same time, land with high capability for agriculture existed which was not being productively used for agriculture. To help identify these areas in each urban-centred region, land was divided into the following categories:

- lands very easily converted to improved agriculture (CLI classes 1-3 under improved grass cover);
- lands easily converted to improved agriculture (CLI classes 1-3 under wooded cover);
- lands of low agricultural capability, potentially suitable for urban expansion (CLI classes 4-7 with no limitations affecting construction);
- lands under site activities (all lands with a constructed cover, regardless of CLI class).

Table 3 shows the area available within each of the categories relative to the area of improved agriculture. The shortage of low agricultural capability land in the Regina and Winnipeg UCRs is very evident. The remaining three centres, however, have substantial areas of lower capability land potentially available for future urban expansion. The Regina and Saskatoon UCRs have the least amounts of land which could be very easily converted to improved agricultural use. This suggests that a greater proportion of high capability agricultural land is actually being used for improved agriculture in the Saskatchewan UCRs than in the Alberta or Manitoba UCRS.

The relative scarcity of land with low to moderate capability for agriculture in the Regina and Winnipeg UCRs provides few opportunities for future urban expansion which will not remove prime agricultural land from production. Planners and municipal officials in the other UCRs have, on the other hand, greater scope for directing future growth towards lands of lower agricultural capability. This is particularly the case for Saskatoon.

FIGURE 4
CALGARY, ALBERTA
URBAN-CENTRED REGION
1981 LAND USE

Source:

Environment Canada
Environnement Canada

FIGURE 5
EDMONTON, ALBERTA
URBAN-CENTRED REGION
1981 LAND USE

N

0 15 km

1:500,000

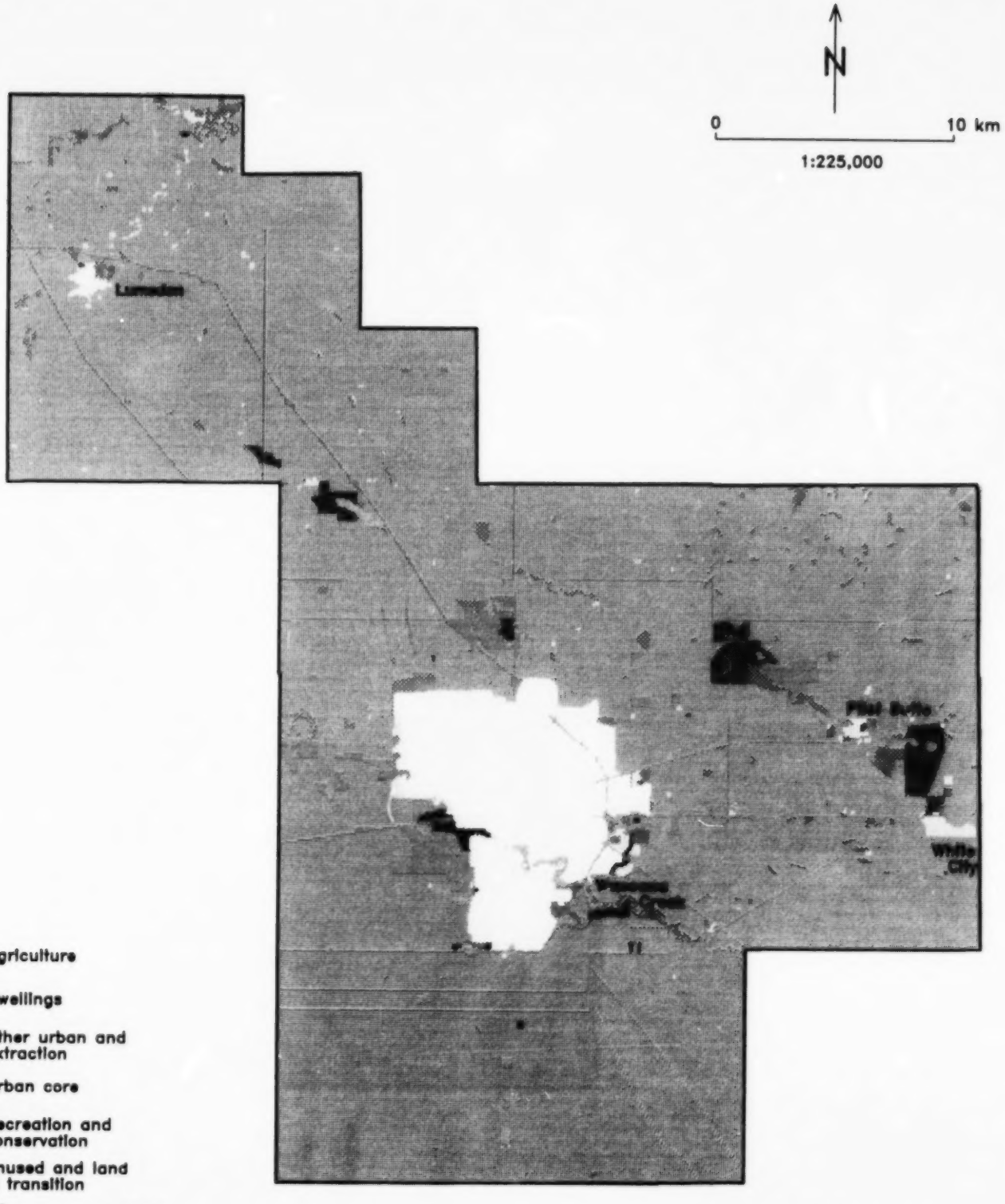
- Agriculture
- Dwellings
- Other urban and extraction
- Urban core
- Recreation and conservation
- Unused and land in transition

Source:

Environment Canada

Environnement Canada

FIGURE 6
REGINA, SASKATCHEWAN
URBAN-CENTRED REGION
1981 LAND USE



Source:

Environment Canada

Environnement Canada

FIGURE 7
SASKATOON, SASKATCHEWAN
URBAN-CENTRED REGION
1981 LAND USE

Agriculture
Dwellings
Other urban and extraction
Urban core
Recreation and conservation
Unused and land in transition

Source:

Environment Canada
Environnement Canada

FIGURE 8
WINNIPEG, MANITOBA
URBAN-CENTRED REGION
1981 LAND USE

N

0 10 km

1:300,000

- Agriculture
- Dwellings
- Other urban and extraction
- Urban core
- Recreation and conservation
- Unused and land in transition

Source: GVMP CUIS

Environment Canada | Environnement Canada

TABLE 3
Resource Potential

	Calgary ha	Edmonton ha	Regina ha	Saskatoon ha	Winnipeg ha
Improved Agriculture	123 682	210 164	71 611	37 748	127 100
Land very easily converted to improved agriculture	41 281	42 897	3 511	3 400	13 308
Land easily converted to improved agriculture	8 337	21 383	294	1 424	7 085
Land of low agricultural capability potentially suitable for urban expansion	17 306	40 734	5 704	30 352	6 012
Land under site activities	38 537	66 613	13 489	10 781	42 196

Methodology

The rural to urban land-use conversion statistics for this fact sheet were derived from the interpretation of aerial photography and field mapping. The scale of photography ranged from 1:20 000 to 1:50 000. Land use was classified according to the CLUMP land activity/land cover classification system. Land activity is the active use made of the land, while land cover is the vegetational and constructed covering of the land surface.

The boundaries of the urban-centred regions were based on those of the 1981 Census Metropolitan Areas with minor adjustments to reflect settlement patterns and physical variations in the landscape.

Statistics Canada 1981 population figures were used to determine whether a UCR met the minimum population criterion of 100 000 for the built-up portion of the Census Metropolitan Areas.

Information on land activity and land cover was transferred from the airphotos to 1:50 000 National Topographic Series base maps. It was then entered into the Canada Land Data System (CLDS), a computerized Geographic Information System, maintained by the Lands Directorate, Environment Canada. This made it possible to connect adjacent maps and overlay various thematic information, including CLI data, for the analysis and production of graphic and statistical data.

Canada Land Use Monitoring Program

The Canada Land Use Monitoring Program (CLUMP) was established in 1978 by the Lands Directorate of Environment Canada to provide researchers, planners, managers, and the public with an information base on land-use change. The Program complements the land capability surveys of the Canada Land Inventory (CLI).

Designed to monitor land use and land-use change over time in various areas of Canada, CLUMP:

- provides improved awareness of the state of the land resource;
- identifies land-use trends of national and regional importance;
- determines major areas of rapid change which can potentially create land-use problems; and
- analyzes land-use trends in terms of causes and consequences, particularly with respect to the impact of federal government policies and programs.

Three major components have been identified for monitoring the diverse forms of land-use change in Canada: urban-centred regions; prime resource lands; and rural areas.

The urban-centred region component examines land use in the rural-urban fringe of urban centres with populations exceeding 25 000. Data will be presented in fact sheets, similar to this one, for major urban centres having populations of 100 000 or more in 1981.

For Further Information

Fact sheets for other urban-centred regions either have been or will be produced, together with a national fact sheet that summarizes rural to urban land conversion data for all UCRs in Canada. Digital data are permanently on file with the Canada Land Data System and are accessible for analysis on a cost-recovery basis. Further information on the Canada Land Use Monitoring Program or the five major prairie UCRs can be obtained from the address below:

Lands Directorate
Western and Northern Region
Environment Canada
#210 - 1102 - 8th Avenue
Regina, Saskatchewan
S4R 1C9

Pour de plus amples renseignements

On a déja produit ou on produira des feuillets d'information pour d'autres régions urbaines, ainsi qu'un feuillet national résumant les données sur la conversion de terres agricoles en terres urbaines pour toutes les régions urbaines du Canada. Les données numériques sont versées en permanence dans le fichier du Système de données sur les terres du Canada et on peut y avoir accès pour fin d'analyse moyennant des frais. Pour plus de renseignements sur le Programme de surveillance de l'utilisation des terres au Canada ou les cinq grandes régions urbaines des Prairies, veuillez écrire à l'adresse suivante.

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